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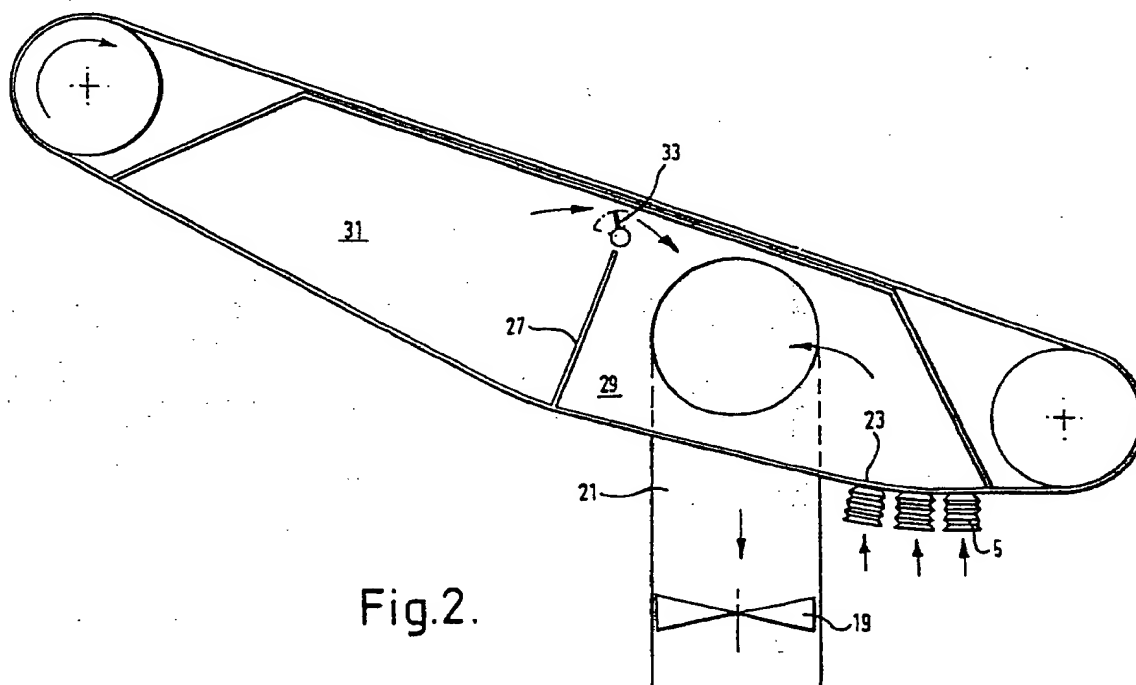
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(54) Depanner including suction cups

(57) A depanner for removing baked products from the pans in which they have been baked comprises an endless belt having mounted thereon a series of suction cups 5, and defining a path including a lower contact area in which the suction cups are in contact with baked products to be depanned. Mounted within the endless belt is a suction chamber coupled to a fan 19 and including a lower face 23 in the region of the lower contact area of the path of the belt which is partially or wholly open such that suction is applied by the suction cups 5 as they pass through the lower contact area. The suction chamber includes at least one internal partition 27 to provide at least a first and a second sub-chamber 29, 31, and is arranged such that a vacuum is applied to the first sub-chamber 29 which is higher than the vacuum applied to the second sub-chamber 31.



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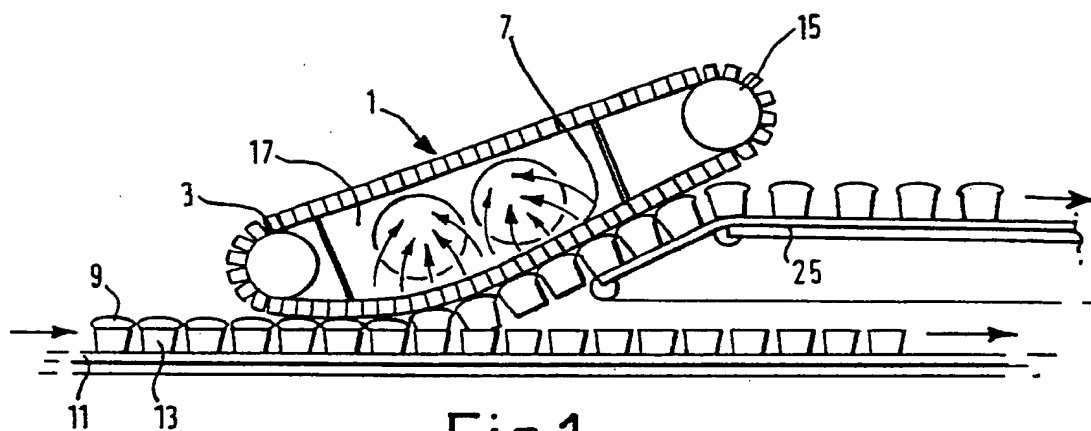


Fig.1.

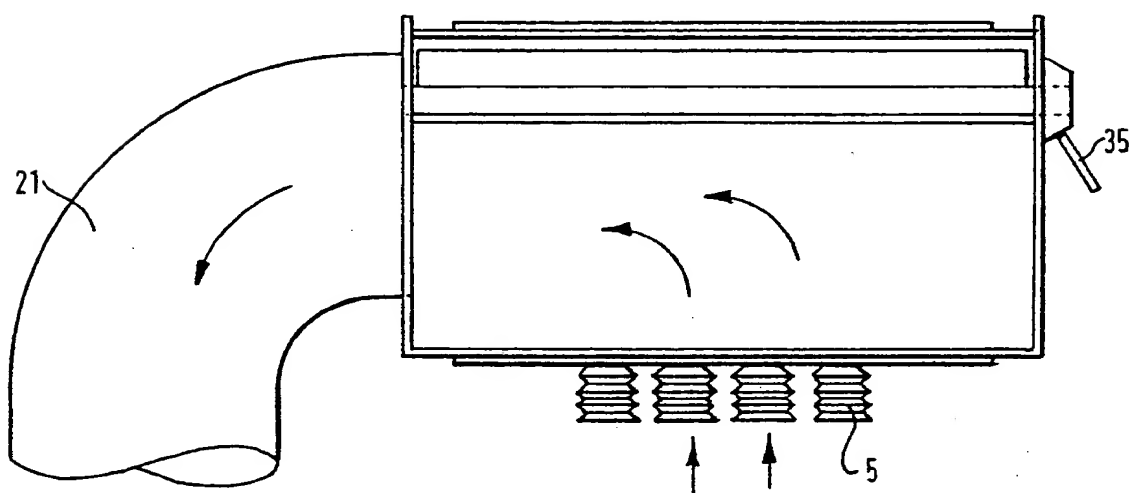


Fig.3.

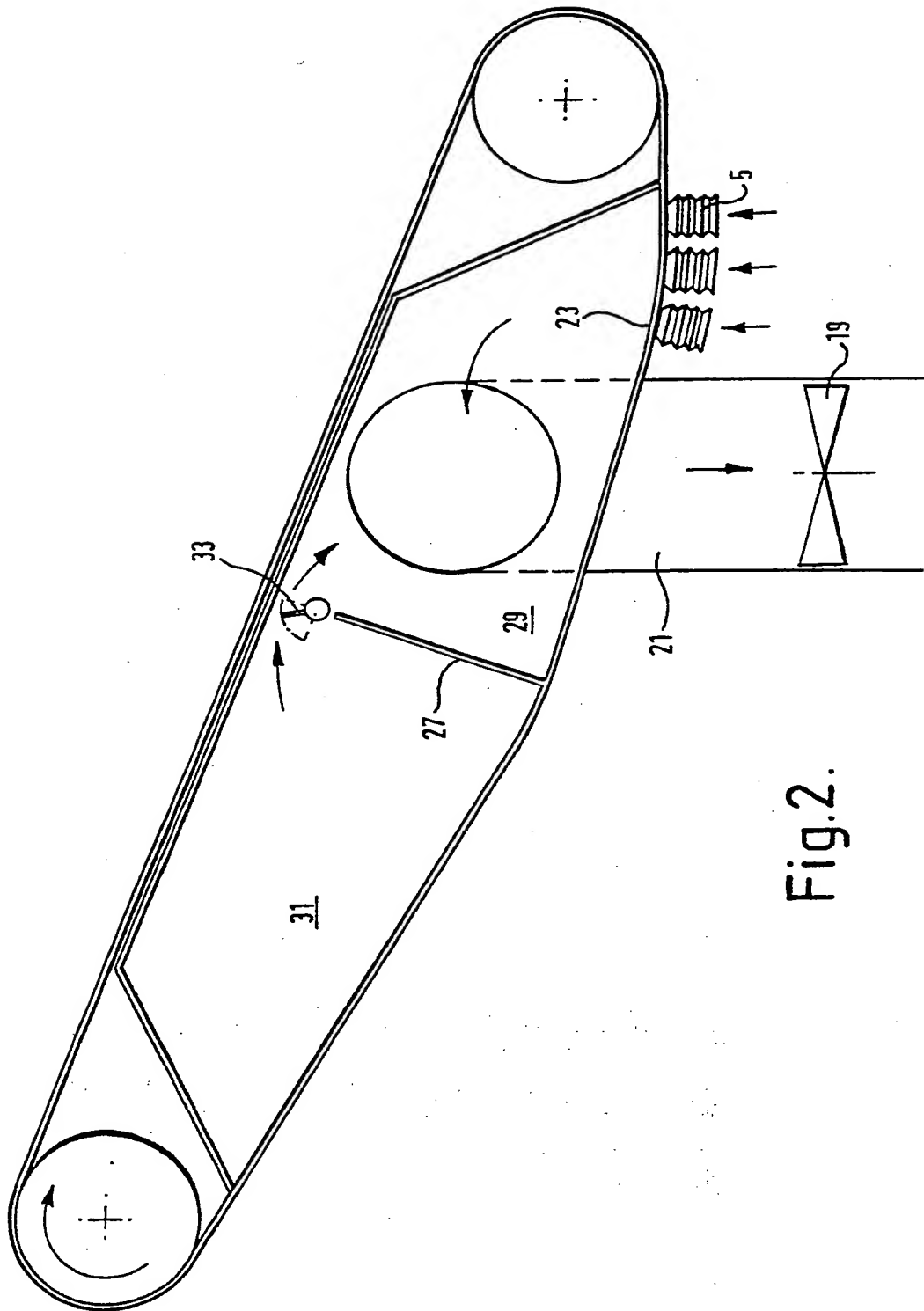


Fig.2.

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IMPROVED DEPANNERField of the Invention

The invention relates to apparatus for removing baked products from the pans in which they have been baked, known as a depanner.

Typically, such a depanner comprises a series of rows of flexible suction cups which are mounted upon a flexible conveyor belt. The conveyor belt is driven such that the flexible suction cups are brought into contact with the baked product, and a low vacuum is applied in order to lift the product. Typically, the baked products can be bread loaves, bread buns, cakes or meringue nests. Such a depanner is not suitable for use with very delicate forms of baked products which are not appropriate for lifting by suction.

The apparatus comprises a flexible conveyor belt which is continuous and is driven along a path which has a lower contact area in which the suction cups mounted upon the belt come into contact with the baked products which are at this stage in their pans and mounted upon a main conveyor belt which runs beneath the flexible belt. The products are removed from their pans and elevated or conveyed to a higher level than the pans in a continuous manner. The flexible conveyor is mounted around and encompasses a suction chamber which is partially or wholly open along its lower surface which is aligned to the lower contact area of the flexible conveyor belt such that vacuum is applied

through the suction cups to allow the products to be picked up out of the pans. The amount of grip the suction belt has on the product depends on a number of factors. These include the total area of suction cups in full contact with the product and the degree of vacuum applied and then the nature of the bread product such as the surface roughness and porosity.

Summary of the Invention

According to the invention, there is provided a depanner including an endless belt having mounted upon it a series of suction cups, and defining a path including a lower contact area in which the suction cups are in contact with baked products to be depanned, and mounted within the endless belt such that the endless belt encompasses it, a suction chamber, the suction chamber being coupled to a fan and including a lower face in the region of the lower contact area of the path of the belt which is partially or wholly open such that suction is applied by the suction cups as they pass through the lower contact area, in which the suction chamber includes at least one internal partition to provide at least a first and a second sub-chamber, and is arranged such that a vacuum is applied to the first sub-chamber which is higher than the vacuum applied to the second sub-chamber.

Thus, the partitions arrange that different degrees of vacuum can be applied to different zones of the suction chamber. Preferably, the first sub-chamber is arranged in the area of the contact area in which the suction cups first come into contact with the baked products and start moving them from the baking pans.

The internal partition may completely subdivide the suction chamber, in which case, each sub-chamber is coupled to a suction fan in which the fans coupled to the first and second sub-chamber apply respectively different suctions.

However, preferably, the internal partition does not completely subdivide the suction chamber. Air flow occurs between the first and second sub-chambers. In such a case, a fan may be provided which is coupled only to the first

sub-chamber such that the suction is applied to the second sub-chamber only through air flow from the second sub-chamber to the first sub-chamber.

Preferably, the apparatus includes means to control the air flow between the first and second sub-chamber.

5 Typically, this comprises an adjustable damper. The damper may be manually controllable such that the operator of the machine may manually control the air flow until the optimal vacuum is applied for a particular type of baked product which is required to be depanned.

10 Alternatively, the damper may be controlled by micro-processor and may include means to ensure that the vacuum is only applied when baked products are passing through the depanner.

15 The suction chamber is preferably wholly open along its lower face. In this case, however, longitudinal ribs are required to define the lower face, to prevent the belt from being sucked into the chamber.

20 The invention is applicable to all forms of depanner for all forms of baked products but is applicable with particular advantage to depanners for depanning loaves from loaf tins, since they can become stuck to the base of the tins, and a higher vacuum is useful for removing them from the loaf tins.

25 Typically, the vacuum applied in the first sub-chamber will be between 250 mm to 1000 mm of water dependent upon the weight and delicacy of the product.

The vacuum applied to the second sub-chamber is typically 200 mm to 700 mm of water.

30 The effect of a relatively high vacuum in the first chamber is that a relatively few number of cups are required to come into contact with the product in order that the upward force exceeds the sum of the downwards push of the flexible rubber suction cups and the weight of the products. Once sufficient suction cups have made contact
35 with the product, they will contract and the product is lifted. Hence, more cups are brought into contact with the

product. Once a large number of cups is in contact with the product, a lower vacuum is required in order to hold the product.

Because the amount of air circulated in order to pick up a given product is reduced, there are several advantages to this system. The ducting required to circulate the air can be smaller and the fan's horse power required is less. This means that the fan can be physically smaller and the smaller power fan creates less noise. Because of the lower vacuum in the second sub-chamber, less noise is created by the suction cups on the sloping face of the suction chamber.

There is also an advantage that the filtration system which most depanners include to remove the crumbs, flours or seeds which have been broken off the product is smaller.

Brief Description of the Drawings

A depanner in accordance with the invention will now be described, by way of example only, with respect to the accompanying drawings in which:-

Figure 1 is a schematic drawing showing the concept of how a depanner operates;

Figure 2 is a section through the endless belt of the depanner of the invention; and

Figure 3 is the end elevation of the endless belt shown in Figure 2.

Description of the Preferred Embodiment

The operation of a depanner 1 is illustrated schematically in Figure 1. An endless belt 3 has mounted upon it a series of rows of suction cups 5. The endless belt 3 defines a path which includes a lower contact area 7 in which the suction cups 5 are in contact with baked products to be depanned. In this case, the products to be depanned are loaves 9 which are passed along a main conveyor 11 in a baking oven (not shown) in their baking pans 13.

The main conveyor 11 passes below the depanning head 15 which consists of the endless belt 3 and its suction chamber 17. The suction chamber 17 is mounted within the

endless belt 13 such that the endless belt 13 encompasses it. The suction chamber is coupled to a fan 19 via an air duct 21 and includes a lower face 23 which is partially or wholly open such that suction is applied by the suction cups 5 as they pass through the lower contact area 7. This means that as the bread loaves 9 pass along the main conveyor 11, they are lifted by the suction cups 5 in the lower contact area 7 and elevated to an auxiliary conveyor 25 which transports the loaves 9 to a cooler (not shown). The pans 13 remain on the main conveyor 11 and are transported to a pan return.

The suction chamber includes an internal baffle 27 which provides a first sub-chamber 29 and a second sub-chamber 31. The suction chamber is arranged such that the vacuum applied in the first sub-chamber 29 is higher than the vacuum applied in the second sub-chamber 31.

The internal partition 27 does not completely subdivide the vacuum chamber and air flow can occur between the second sub-chamber 31 and first sub-chamber 29. The air duct 21 via which the suction is applied is coupled to the first sub-chamber 29 so that the vacuum applied here is higher than in the second sub-chamber 31.

A manually operable damper 33 is provided which is rotatable via handle 35 to adjust the air flow from the second sub-chamber 31 to first sub-chamber 29. This can vary the vacuum in each sub-chamber dependent upon the product to be depanned.

The vacuum to be chosen for the particular baked products will be readily apparent to the man skilled in this field. Typically, the vacuums required to remove bread loaves from their baking pans are 800 mm of water in the first sub-chamber and 600 mm of water in the second sub-chamber. When the baked products are more delicate, for example bread rolls, the vacuum suction applied will be much less, probably less than 350 mm of water.

Claims

1 A depanner including an endless belt having mounted
upon it a series of suction cups, and defining a path
including a lower contact area in which the suction cups
are in contact with baked products to be depanned, and
5 mounted within the endless belt such that the endless belt
encompasses it, a suction chamber, the suction chamber
being coupled to a fan and including a lower face in the
region of the lower contact area of the path of the belt
which is partially or wholly open such that suction is
10 applied by the suction cups as they pass through the lower
contact area, in which the suction chamber includes at
least one internal partition to provide at least a first
and a second sub-chamber, and is arranged such that a
vacuum is applied to the first sub-chamber which is higher
15 than the vacuum applied to the second sub-chamber.

2 A depanner according to claim 1, in which the first
sub-chamber is arranged in the area of the contact area in
which the suction cups first come into contact with the
baked products.

20 3 A depanner according to claim 1, or claim 2, in
which the internal partition does not completely subdivide
the suction chamber, and air flow occurs between the first
and second sub-chambers.

4 A depanner according to claim 3, in which a fan is
25 provided which is coupled to the first sub-chamber such
that the suction is applied to the second sub-chamber

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through air flow from the second sub-chamber to the first sub-chamber.

5 A depanner according to claim 3 or 4, which also includes means to control the air flow between the first and second sub-chamber.

6 A depanner according to claim 5, in which the means to control the air flow comprises an adjustable damper.

7 A depanner according to claim 6, in which the damper is manually controllable.

10 8 A depanner according to claim 6, in which the damper is controlled by microprocessor and includes means to ensure that the vacuum is only applied when baked products are passing through the depanner.

15 9 A depanner according to any one of the preceding claims, in which the suction chamber is wholly open along its lower face, and longitudinal ribs define the lower face, to prevent the belt from being sucked into the chamber.

20 10 A depanner according to any one of the preceding claims, in which the vacuum is applied in the first sub-chamber is between 250mm to 1000mm of water.

11 A depanner according to any one of the preceding claims, in which the vacuum applied to the second sub-chamber is 200mm to 700mm of water.

25 12 A depanner arranged substantially as described herein, with reference to and as illustrated in, figures 1 to 3 of the accompanying drawings.

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